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A Report on Wild Life Surveys in South and West India

November-December 1966

BY

J. JUAN SPILLETT

INTRODUCTION

This is a continuation of the ' Report on Wild Life Surveys in North India and Southern Nepal, January-June 1966', [*J. Bombay. nat. Hist. Soc.* **63** (3) (December 1966)]. As before, these surveys in the States of Andhra Pradesh, Mysore, Madras and Gujarat were officially sponsored by the World Wildlife Fund (Morges, Switzerland), assisted by the Johns Hopkins University Center for Medical Research and Training, approved by the Government of India and financed by the Foundation Volkart Brothers of Switzerland.

Mr. E. P. Gee made all the necessary arrangements with the Government of India and with the State Forest Departments concerned, supervised the whole project, and collected and edited the reports of each

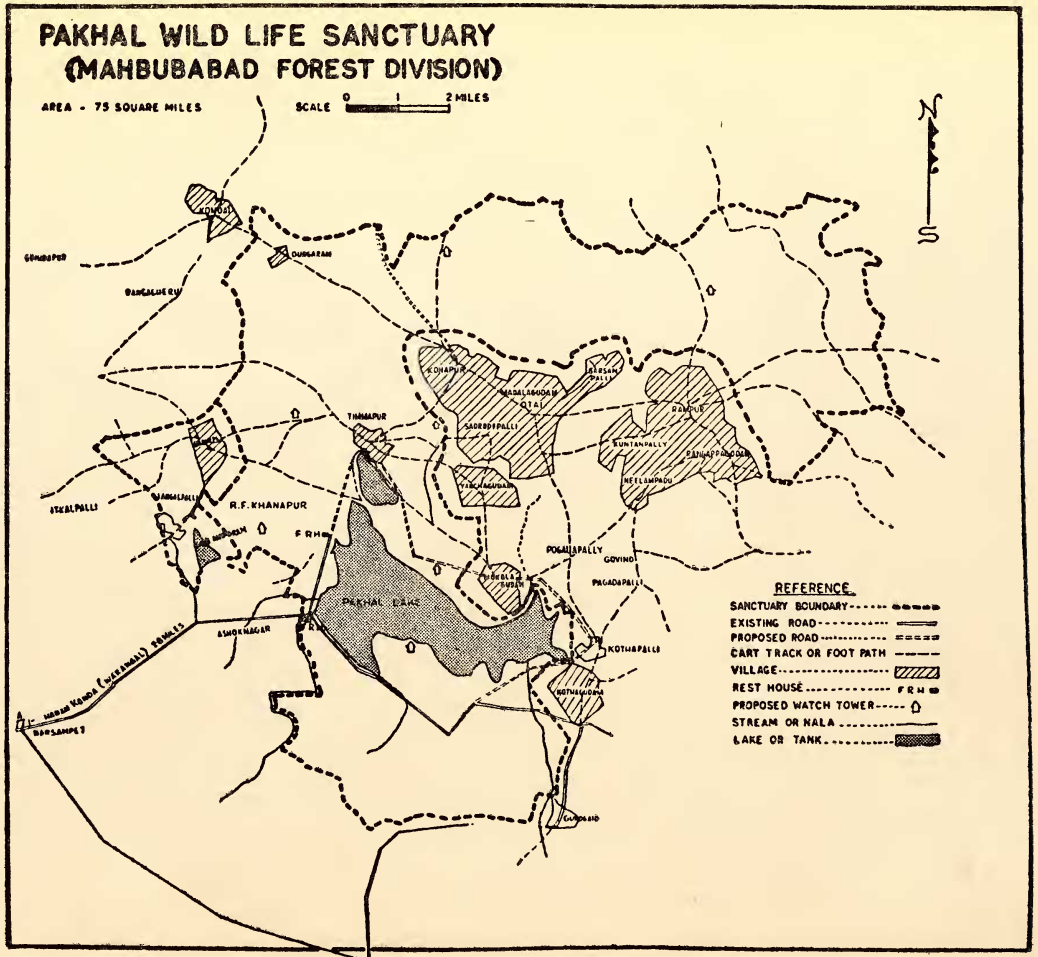
[1] The reports on sanctuaries in Mysore and Madras States will be published in subsequent issues of Vol. 65—Eds.

State—incorporating the suggestions received from the State Forest and Wild Life Officers concerned. I particularly want to thank him for his assistance and advice.

It was intended to include Kerala State, particularly the Periyar Wild Life Sanctuary, in the surveys. But a reply could not be obtained from that Forest Department until it was too late and the whole programme had been finalised. It is to be hoped that at some future date the valuable wild life resources of Kerala can be included in a similar survey.

My thanks are again extended to all concerned for their assistance, co-operation and kindness so willingly given to me throughout the surveys. Without this co-operation the surveys could not have been undertaken.

J. JUAN SPILLETT



Map 1. General Map of the newly proposed Pakhal Wild Life Sanctuary, Andhra Pradesh. The boundary line, which is to be demarcated, existing roads and roads to be constructed prior to 1971 are depicted.

Wild Life Sanctuaries in Andhra Pradesh[1]

BY

J. JUAN SPILLETT

(With a plate and two maps)

TABLE

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[1] This survey was officially sponsored by the World Wildlife Fund, Morges, Switzerland. The project was also assisted by The Johns Hopkins University and its Center for Medical Research and Training, Calcutta, India, and Baltimore, Maryland (U.S.A.). Mr. E. P. Gee, member of the Indian Board for Wild Life, made the necessary arrangements with the Government of India and the Forest Department of Andhra Pradesh, both of which extended their fullest co-operation.

I. Introduction

Mr. Mazharuddin Ahmed (Deputy Chief Conservator of Forests) met me on my arrival in Hyderabad on November 17, 1966, and kindly accompanied and assisted me throughout my 6-day tour in Andhra Pradesh. We travelled by car to Hanamkonda, 90 miles north-east of Hyderabad, and there met Mr. M. S. Khan (Warangal Circle Conservator of Forests) and other Government and Forest Department officers for that area. We discussed at length the wild life of Andhra Pradesh, the problems confronting these valuable resources and the possibility, through intensive management, of the State's wild life becoming a tourist attraction and a major source of revenue.

II. THE PAKHAL WILD LIFE SANCTUARY

Introduction

Pakhal Lake is situated in a beautiful forest setting 28 miles east of Hanamkonda (Warangal) in the Narsampet Taluk of Warangal District. An area of almost 350 square miles surrounding the lake was declared a wild life sanctuary in 1953. However, apart from the prohibition of legal shooting, this area has been a sanctuary in name only. Forest produce of all types has been extensively exploited and domestic livestock grazing has been permitted throughout most of the area. Much of the sanctuary has been severely overgrazed. In addition, encroachment or settlement and cultivation by villagers inside the sanctuary has continued almost completely unabated. To remedy this situation, the Forest Department presently proposes that a 75-square-mile area, including the 8·07 square-mile Pakhal Lake and the adjacent forest areas, be constituted and preserved as a true wild life sanctuary. In short, the Forest Department now proposes to maintain this unit as a real ' Sanctum Sanctorum'.

Pakhal Lake was formed by the construction of an earthen dam during the Kakatiya Dynasty in the early 1600's. The dam was renovated by the Public Works Department (P.W.D.) in 1918 and the lake presently provides water for the irrigation of almost 9000 acres of fertile agricultural land to the south-west. The forest areas surrounding the lake served as a hunting reserve for the Nizam when Hyderabad was a princely state. The area was then renowned for its numerous tigers, as well as for large mammals such as chital, sambar, blackbuck, nilgai, four-horned antelope and chinkara. In 1948, shortly after Independence, this area came under the jurisdiction of the Government of India and the Forest Department.

The preservation and management of Pakhal as an inviolate wild life sanctuary will fulfill a multi-purpose objective. First, it will help to

preserve a part of India's unique and once vast, but now fast disappearing, wild life heritage. In turn, through proper management, the sanctuary should shortly become a notable tourist attraction and a valuable economic asset both to the State and to the Nation. Also of importance, the catchment areas surrounding the lake will now be protected, thus helping to prevent erosion of the forest slopes and ensuring a stable water supply for the agricultural lands of Warangal District.

All forest exploitation, including the grazing of domestic livestock, will be excluded from the proposed 75-square-mile 'L-shaped' sanctuary as of April 1967 (Map 1). The sanctuary will also be clearly demarcated from surrounding areas by clear-felling and maintaining an approximately 50-foot-wide boundary line along the perimeter. A single road enters the sanctuary near the forest rest house and bisects it south of the lake. Entrance into and activities within the sanctuary should therefore be quite easily controlled by a relatively small Forest Department staff.

Three small forest villages inside of the proposed sanctuary (Durgarum, Dabirpet, and Timmapur), with a total population of less than 300 people, will be resettled elsewhere on Forest Department lands. A number of villages north and east of Pakhal Lake were too large to permit such action. Therefore, they will be excluded from the sanctuary by the boundary line. Initially the exclusion from the sanctuary of almost 4000 head of livestock from these villages may present some difficulties. However, there are sufficient grazing lands available for these animals either in the immediate vicinity of the villages or in Forest Department lands south and east of the sanctuary. There is no justifiable reason why domestic livestock should not be completely and permanently excluded from the entire sanctuary. Such problems should be met and permanently settled as soon as possible.

Ecology

The Pakhal Wild Life Sanctuary is located at an elevation of 850 feet above sea-level. There are no perennial streams in the area. However, the lake, which attains a maximum depth of 18 feet, is fed by a number of ephemeral streams. Rainfall is monsoonal (June-September) and the average annual precipitation is about 40 inches (1000 mm.). The maximum temperature during summer (March-June) is 114·0° F. (45·5° C.) and the minimum during winter (November-February) is 59·20 F. (15·1° C.).

Flora

The forests in the sanctuary area, according to Champion's classification, are of the southern dry mixed deciduous type and their density

varies from 5 to 7. The forest height is generally from 30 to 40 feet, but along the ravines or *nullahs* the trees often attain a height of about 60 feet.

The predominant species of trees are : *maddi* (*Terminalia tomentosa*), *tirman* (*Anogeissus latifolia*) and *nalla kodsha* (*Cleistanthus collinus*). Also common are : *anduk* (*Boswellia serrata*), *billu* (*Chloroxylon swietenia*), *tooki* (*Diospyros choloroxylon*), *sundra* (*Acacia sundra*), *tapsi* (*Sterculia urens*) and *kondagogu* (*Cochlospermum religiosum*). Teak (*Tectona grandis*) is common in some parts of the sanctuary and numerous other tree species are relatively common in others. *Theega moduga* (*Butea superba*) and *parki* (*Acacia caesia*) are the most common climbers. There are very few shrubs or bushes in the area.

Fauna

Numerous species of birds were observed during my brief visit. Among the more obvious noted were : peafowl, grey junglefowl, both grey and painted partridge, ring doves, green pigeon, mynas, babblers, egrets, grey hornbills, roseringed and blossomheaded parakeets, cormorants, herons, Indian rollers and woodpeckers, as well as many smaller species. Other animals observed or reported to inhabit the sanctuary and a relative index as to their abundance is given in Table 1. Gaur or Indian 'bison' (*Bos gaurus*) are not found in the sanctuary, but are common in the forests of the Salvai and Pasra ranges approximately 5 miles to the north-west. Among the fish that inhabit Pakhal Lake are 'katla' (*Catla catla*), 'rohu' (*Labeo rohita*) and 'marul' (*Ophicephalus striatus*).

Visitor Facilities and Forest Department Proposals

The nearest commercial airport to the Pakhal Wild Life Sanctuary is at Hyderabad (Begumpet), 118 miles to the south-west. Flights from other major cities in India arrive there daily. There is also an airstrip at Mannoor, about 30 miles from the sanctuary near Warangal. Private or chartered planes may land there by special permission. Railway stations are located at Kazipet (Warangal), which adjoins Hanamkonda, and at Nekkonda, which is 20 miles from Pakhal. Public transport can be taken from either of these places to the sanctuary. The first 21 miles of road from Hanamkonda to Pakhal is blacktopped and the last 7 miles is a good metalled road. Although the sanctuary is readily accessible by car throughout the year, the best season for visitors is from October until March.

There are presently less than 10 miles of forest roads within the proposed sanctuary. However, the Forest Department proposes to build a 'ringroad' around the lake, as well as 'feeder' roads to

Above : Pakhal Lake as seen from the Sarovihar Rest House ; *Below :* A male four-horned antelope.

(*Photos : Author*)

six watchtowers in the interior of the sanctuary, by the end of 1971. In addition to the road that now bisects the sanctuary south of the lake, the ringroad will entail the construction of another 15 miles of road. The feeder roads leading to the watchtowers will average about 2 miles each. Artificial salt licks also will be constructed in the vicinity of the watchtowers. These improvements should permit visitors to view wild life, particularly during the summer when the animals are concentrated around Pakhal Lake which is the only available source of water during the dry season. The Forest Department also plans to provide a jeep and to have a riding elephant stationed at the forest rest house for the use of visitors.

Pakhal Lake has the potential of becoming a noted fishing area, as well as a recreational site for boating, camping, and picnicking. The Forest Department presently has a row-boat stationed at the lake for the use of visitors and plans to have a motor-boat available in the near future. Some forest areas adjoining the lake, particularly the area just below the dam, are excellent picnic sites and their development as such should be considered.

There are two rest houses within the sanctuary. Both have magnificent views of Pakhal Lake and are located along its shores. One (Sarovihar) is located across the dam on the western shore. It has four suites and is presently under the control of the Tourist Department (Directorate of Publicity and Information), but should come under the jurisdiction of the Forest Department during the early part of 1967. A cook and modern conveniences, such as electricity provided by a small generator, are available here. The other rest house is located about a half-mile south of Sarovihar, a short distance from where the road from Hanamkonda enters the sanctuary. This Forest Department Rest House has three suites, but presently is not provided with modern conveniences. The Forest Department proposes to renovate the building and to provide the services of both a cook and an electric generator prior to 1968. Information concerning the sanctuary or reservations for accommodations can be obtained from either the Divisional Forest Officer, Mahbubabad, Warangal District, or from the Chief Conservator of Forests in Hyderabad.

The most important of the Forest Department's proposals are the strict prohibition of domestic livestock grazing and the discontinuation of forest operations, including the collection of minor forest produce, inside the sanctuary. Plans for clearly demarcating the sanctuary and providing amenities for visitors, i.e., accommodation, roads, transportation, and so forth, are also noteworthy. Among other improvements envisioned are: the provision of six watch-towers near artificial salt licks, road blocks to control movements inside the sanctuary, the construction of quarters for the sanctuary staff, the provision of a library on wild life

TABLE 1

NAMES OF SOME ANIMALS INHABITING THE PAKHAL WILD LIFE SANCTUARY, ANDHRA PRADESH, AND A RELATIVE INDEX OF THEIR ABUNDANCE

English	Local	Scientific	Abundance
Tiger	Bagh, Sher	*Panthera tigris*	rare
Leopard or Panther	Tendwa, Chita	*Panthera pardus*	rare
Jungle Cat	Khatas, Jungli billi	*Felis chaus*	common
Striped Hyena	Hundar, Lakkar	*Hyaena hyaena*	rare
Wild Dog or Dhole	Dhole, Jangli kutta	*Cuon alpinus*	rare
Jackal	Gidhar, Kola	*Canis aureus*	common
Indian Fox	Lomri, Lom, Lotri	*Vulpes bengalensis*	frequent
Common Mongoose	Mangus, Newal	*Herpestes edwardsi*	common
Sloth Bear	Bhalu, Rinch, Reech	*Melursus ursinus*	rare
Wild Boar	Suar, Barba	*Sus scrofa*	common
Sambar	Sambar, Samar	*Cervus unicolor*	common
Chital or Spotted Deer	Chital, Chitra	*Axis axis*	common
Barking Deer or Indian Muntjac	Kakar	*Muntiacus muntjak*	frequent
Nilgai or Bluebull	Nil, Nilagai	*Boselaphus tragocamelus*	common
Chinkara or Indian Gazelle	Chinkara, Kalpunch	*Gazella gazella*	rare
Blackbuck or Indian Antelope	Harna, Harni, Kalwit	*Antilope cervicapra*	rare
Four-horned Antelope or Chousingha	Chowsingha, Chowka Doda	*Tetracerus quadricornis*	rare
Common Indian Porcupine	Sayal, Sahi	*Hystrix indica*	common
Indian Hare	Khargosh	*Lepus nigricollis*	common
Common Langur or Hanuman Monkey	Langur, Hanuman	*Presbytis entellus*	common
Rhesus Macaque	Bandar	*Macaca mulatta*	frequent
Indian Python		*Python molurus*	rare
Cobra	Nag	*Naja naja*	rare
Russel's Viper	Sus-Karna	*Vipera russelli*	rare
Banded Krait		*Bungarus fasciatus*	rare
Rat Snake	Dhaman	*Ptyas mucosus*	common
Mugger	Magger Mach	*Crocodilus palustris*	frequent

in one of the rest houses, and the purchase of equipment which will better enable members of the sanctuary staff to perform their duties, i.e., a typewriter, binoculars, bicycles for the Assistant Game Wardens and Game Trackers, etc. A detailed working plan and budget for the implementation of the proposals and for the maintenance of the sanctuary staff has already been submitted to the State Government by the Forest Department.

Discussion

The scenic beauty of Pakhal Lake in its sylvan setting is sufficient grounds for setting this area apart as a park or recreational site. The wild life may be classified as an added attraction. Although relatively few wild mammals were observed during my visit, their numbers should soon increase if the proposed measures to prohibit all livestock grazing and forest exploitation inside the sanctuary are fully implemented. The possibilities are very good that within a few years visitors may readily observe numerous animals such as chital, nilgai, sambar, and so on.

It is to be hoped that in the implementation of the measures proposed by the Forest Department the sanctuary will be retained in as natural a state as possible ; that an excessive number of roads will not be constructed ; that the areas surrounding the rest houses or the quarters of the administrative staff will not be permitted to become virtual villages within the sanctuary ; and that the recommendations of the Indian Board for Wild Life (Gee 1962) and other international organizations concerned with conservation will be carefully considered and as closely adhered to as possible in the development of this outstanding area.

Administrative personnel for the Pakhal Wild Life Sanctuary should be carefully chosen. Men with a genuine interest in wild life conservation should be given preference. If at all possible, the staff members should also become acquainted with some of the basic concepts of wild life management. Once the basic amenities for visitors are available at the sanctuary, a publicity programme should be initiated to help as many people as possible become aware of what this area has to offer. A continued programme of conservation education should also be maintained. Competent biologists should be encouraged to conduct scientific studies of the sanctuary's wild life. Check-lists of the flora and fauna should also be compiled, both for the information of visitors and the Forest Department staff. A visitor's book should be maintained so that all who enter the sanctuary may record their observations concerning the sanctuary's wild life.

A wild life sanctuary is an investment in the future. Like any sound business it requires a capital outlay, upkeep, and proper management before a substantial return may be realized. In my opinion, the present proposals of the Forest Department are a major step in the right direction.

III. THE ETURNAGARAM WILD LIFE SANCTUARY

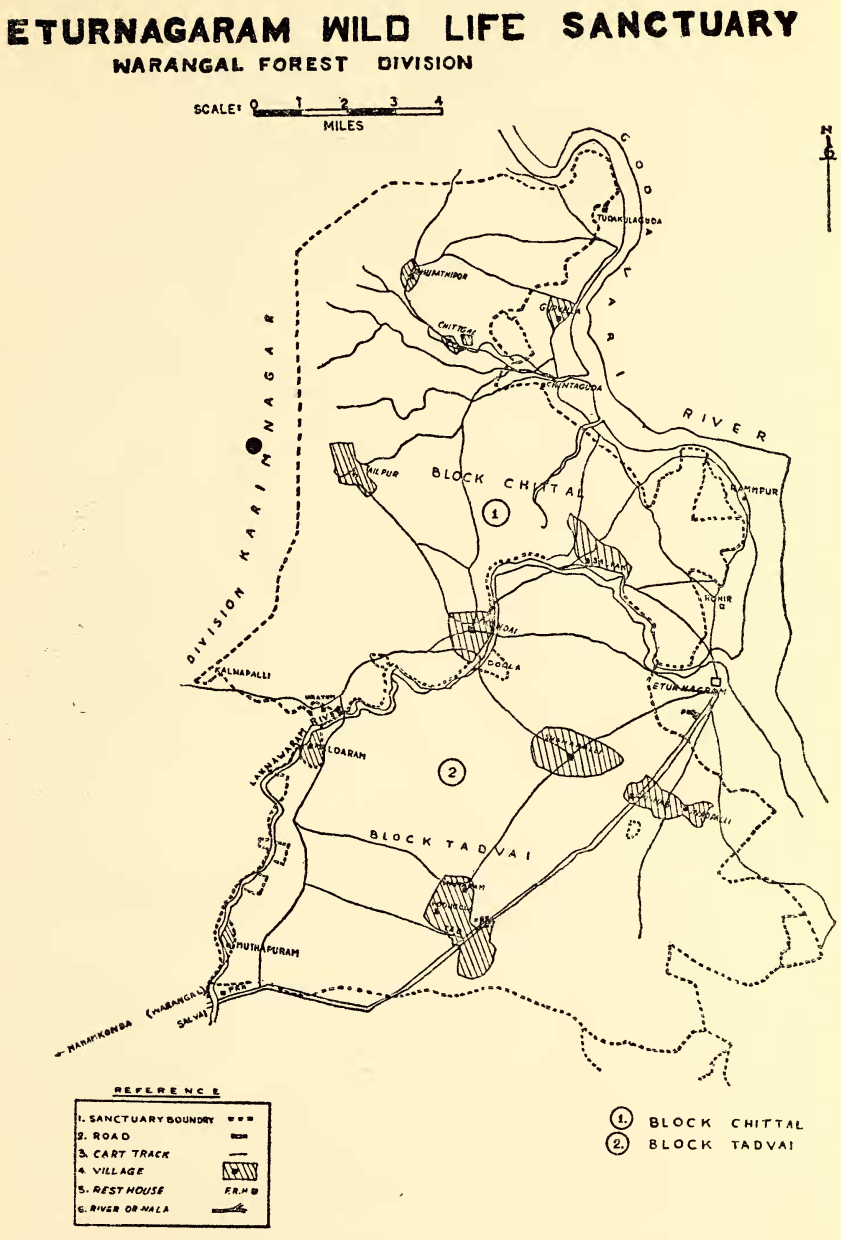
Introduction

A 310-square mile area 40 miles north of Hanamkonda in the Warangal Forest Division, Warangal District, was constituted in 1953 by the Government of the State of Hyderabad as the Eturnagaram Wild Life Sanctuary. This extensive area covers the entire forest blocks of Chittal and Tadvai. The Godavari River forms the eastern boundary of the sanctuary and the other three sides are demarcated by boundary lines through the forests. However, similar to the situation in the Pakhal Wild Life Sanctuary, little more has been done for the protection or management of the Sanctuary's wild life than to prohibit legal shooting. Extensive forest exploitation, domestic livestock grazing and other activities have been and are presently being practiced inside the sanctuary. There are 44 villages, with a total cattle population of almost 10,000 head, in Eturnagaram. In addition, a few professional graziers also operate in this area. In spite of these many activities, many parts of the sanctuary are still relatively little spoiled by man and provide prime wild life habitat.

It is presently proposed by the Forest Department that the Eturnagaram Wild Life Sanctuary be reduced in size to a more manageable unit. This would consist of an approximately 150-square-mile area, the Tadvai Forest Block, south of the Laknavaram River. The Laknavaram would then form both the northern and western boundaries of the sanctuary and the Godavari River the eastern boundary. The Tadvai Reserved Forest would adjoin the sanctuary to the south (Map 2). The Chittal Forest Block north of the Laknavaram is relatively inaccessible, particularly during the monsoon season. It also contains a larger number of forest villages than does the Tadvai Block. The main road from Hanamkonda passes through the Tadvai Block and the sanctuary's three forest rest houses are located along this road. Therefore, it appears that the Forest Department is wise in attempting to concentrate their efforts in the preservation and management of this more restricted area as a true wild life sanctuary, rather than to retain a more extensive area as a wild life sanctuary in name only.

Ecology

The Eturnagaram Wild Life Sanctuary is located at an elevation of about 251 feet above sea-level. Although there are a number of ephemeral streams inside the sanctuary, the Godavari and Laknavaram rivers are the only source of perennial water. Rainfall is monsoonal (June-September). Data as to the average annual precipitation, and maximum and



Map 2. General Map of the Eturnagaram Wild Life Sanctuary, Andhra Pradesh. It is presently proposed that the sanctuary be reduced in size to include only the Tadvai Forest Block south of the Laknavaram River.

minimum temperatures for this area are not available. However, the more luxuriant vegetation indicates that Eturnagaram receives more rainfall than does Pakhal, even though it is only about 30 air miles away.

Flora

The forests of Eturnagaram are classified as southern dry mixed deciduous, the same as for Pakhal, but they are more dense and have an average height of 40 to 60 feet. Second and third class teak, *maddi* and *tirman* are the predominant tree species in Eturnagaram. In contrast, teak is relatively uncommon in most parts of Pakhal. The proportion of other tree species, such as *anduk*, *billu*, *sundra*, *tapsi*, and so forth, are more or less the same for the two areas. However, the undercover is more dense in Eturnagaram and *Dendrocalamus strictus* predominates.

Fauna

In general, animal life (including birds, mammals, and reptiles) is similar for both Pakhal and Eturnagaram Wild Life Sanctuaries. However, large mammals are presently more abundant and more readily seen in Eturnagaram. Also, gaur are common in Eturnagaram while absent in Pakhal, and blackbuck are probably absent in Eturnagaram but present in Pakhal. Little is known concerning the species of fish in the Godavari and Laknavaram Rivers in the vicinity of Eturnagaram.

We observed fair numbers of sambar, chital, and nilgai during the afternoon and evening of November 19. The presence of gaur was also very much in evidence. The following morning the Forest Department conducted a beat or *haka* along the western edge of the sanctuary. We arose prior to 4 o'clock in the morning and quietly took our positions as 'counters' in machans along a cleared line through the forest. At dawn, over 500 men (some 450 villagers + 50 Forest Department personnel) moved systematically through a one-square-mile forest area. 'Stoppers' had been placed at strategic locations along the sides and the 19 'counters' recorded the animals that crossed the cleared line to the right of their machans. The operation was the third conducted in this area during the past four years. Such checks give an indication of trends in wild life populations and should be repeated at yearly intervals. Everything was well-planned and executed. The total count for large mammals in this square mile was : 1 barking deer, 8 chital, 5 sambar, 1 male gaur, and 2 sloth bear.

Visitor Facilities

The city nearest to the Eturnagaram Wild Life Sanctuary is Hanamkonda, 40 miles south of the western boundary. The nearest railway station is at Kazipet (Warangal) adjoining Hanamkonda. The road from

Hanamkonda to the western edge of the sanctuary is black-topped and the P.W.D. road, which crosses the southern part of the sanctuary to the Eturnagaram Forest Rest House, is metalled. There are an additional 10 or 12 miles of metalled roads inside the sanctuary, as well as an estimated 160 miles of jeepable roads or cart tracks. At present the only means of transport to or within the sanctuary is by private vehicle.

There are three rest houses in the Eturnagaram Sanctuary area. Tadvai has one suite and Eturnagaram and Salvai each have two. Information concerning the sanctuary or reservations for the forest rest houses at Tadvai or Eturnagaram can be obtained from the Warangal Divisional Forest Officer in Warangal. Salvai, as well as the Traveller's Bungalow with four suites and all facilities in Hanamkonda, is under the jurisdiction of the P.W.D. Divisional Engineer in Warangal. In addition to the rest houses at Eturnagaram, there are also residential quarters and 17 Forest Guard Stations for the sanctuary staff, which consists of a Deputy Range Officer and 15 Forest Guards.

Discussion

Eturnagaram has the potential of becoming an outstanding wild life sanctuary. However, primarily due to its relatively inaccessible location and the fact that there are no notable scenic or archaeological attractions near-by, the immediate development of this area as a major tourist attraction probably should not be initiated at the present time by the Forest Department. Nevertheless, immediate steps should be taken to preserve and protect this area so that it may some day achieve its full potential as one of India's notable wild life sanctuaries. Such measures should entail : the strict control of livestock grazing within the sanctuary ; if possible, the forest villages inside the Tadvai Forest Block should be relocated outside the sanctuary or at least settled or cultivated areas in the sanctuary should be restricted to their present limits; that the sanctuary staff be indoctrinated in the basic concepts of wild life conservation and be made aware of the value of the wild life resources under their jurisdiction ; and that existing facilities, i.e. roads and rest houses, be maintained and gradually improved. Also, if forest exploitation is continued within the sanctuary, wild life should be carefully considered in the Forest Department's working plans. Wild life is an important and integral part of the State's forest resources and like the trees should be managed for the greatest benefit for the greatest number of people in the long run. Visitor books, as well as a record of wild life observations by the staff, should be maintained in the sanctuary. Wild life studies should be encouraged in this area and regular inventories or checks, such as the ' hakas ' conducted during recent years, should be continued so that the Forest Department will have a sound basis upon which to formulate management plans.

IV. OTHER WILD LIFE AREAS IN ANDHRA PRADESH

The Qawal Wild Life Sanctuary

A 200-square-mile area in the Jannaram Forest Range, Mancherial Division of Adilabad District, was declared a wild life sanctuary in June 1964. The nearest airport is at Hyderabad (Begumpet) 180 miles to the north. The nearest railway station is at Mancherial, 40 miles to the south-east. Regular scheduled buses are available from Mancherial to the sanctuary. Forest rest houses are available at Jannaram and Birsaipot. Information or reservations can be obtained from the Jannaram Divisional Forest Officer in the Adilabad District. Although I did not have the opportunity of visiting this sanctuary, it is reported that tiger, leopard, sloth bear, wild boar, sambar, chital, barking deer, nilgai, and blackbuck are among the animals that inhabit this area.

Kolleru

Kolleru Lake in the West Godavari District, which is under the jurisdiction of the Public Works Department, is a notable area for water birds. Of particular interest are the large concentrations of spotted-billed or grey pelicans, as well as migratory waterfowl during the winter, on or in the vicinity of this lake.

The pelicanry is situated between the towns of Ganapavaram and Undi in West Godavari District. It is 7 to 8 miles from Kolleru Lake.

December to February is the best season to visit the pelicanry.

Accommodation for visitors is available at Ganapavaram, Undi, Akkivedu and Bhimavaram in the existing travellers' bungalows.

The Pocharam Wild Life Sanctuary

This sanctuary could be developed into a bird sanctuary. There is a tank in the notified area and efforts are being made to develop it into a bird sanctuary. Pocharam is in Medak District.

Nehru Zoological Park

The Nehru Zoological Park in Hyderabad is not, strictly speaking, a wild life area. However, over 135 species of wild birds have been recorded during recent years within its 302-acre walled-in enclosure. Good numbers of waterfowl may also be observed in the zoo's ' bird sanctuary ' during the migratory season. I also observed several free roaming troops of bonnet macaques (*Macaca radiata*) within the zoo's confines. However, the large number of both endemic and exotic forms of animal

life belonging to the garden deserves mention. To a great extent these animals are housed in modern enclosures, rather than in cages.

The zoological park is supervised by the Forest Department. Although it was started only recently in 1959 and is still in the developmental stages, it already presents a notable collection of animals. The setting is unique. A 13,200-foot solid masonry wall encloses a beautiful desert scrub forest and on one end abuts the Miralam Tank, a 400-acre lake formed by an arched masonry dam built in 1806. Added attractions include : a swimming pool, boat, elephant, camel, goat cart and pony rides ; a house-boat available for parties on the lake and two well-furnished guest houses overlooking the lake. Reservations for the house-boat or guest houses may be made through the Curator stationed in the park.

V. Acknowledgements

I wish to thank Mr. P. S. Rao (Chief Conservator of Forests) and the Forest Department for their assistance and gracious hospitality during my brief tour of some of the notable wild life areas in Andhra Pradesh. Particularly I am grateful to Messrs. Mazharuddin Ahmed (Deputy Chief Conservator of Forests), M. S. Khan (Warangal Circle Conservator of Forests), A. V. R. G. Krishnamurthy (Karimnagar East Divisional Forest Officer), P. Kumar (Curator, Nehru Zoological Park), as well as to other Forest Department personnel too numerous to mention individually. Without exception all were very hospitable, patiently answered my numerous questions, and attempted to give me a true picture of the status of the wild life in the areas under their jurisdiction.

VI. References

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Wild Life in Gujarat State[1]

BY

J. JUAN SPILLETT

(*With four plates and two maps*)

[1] This survey was officially sponsored by the World Wildlife Fund, Morges, Switzerland. The project was also assisted by The Johns Hopkins University and its Center for Medical Research and Training, Calcutta, India, and Baltimore, Maryland (U.S.A.). Mr. E. P. Gee, member of the Indian Board for Wild Life, made the necessary arrangements with the Government of India and the Forest Department of Gujarat, both of which extended the fullest co-operation.

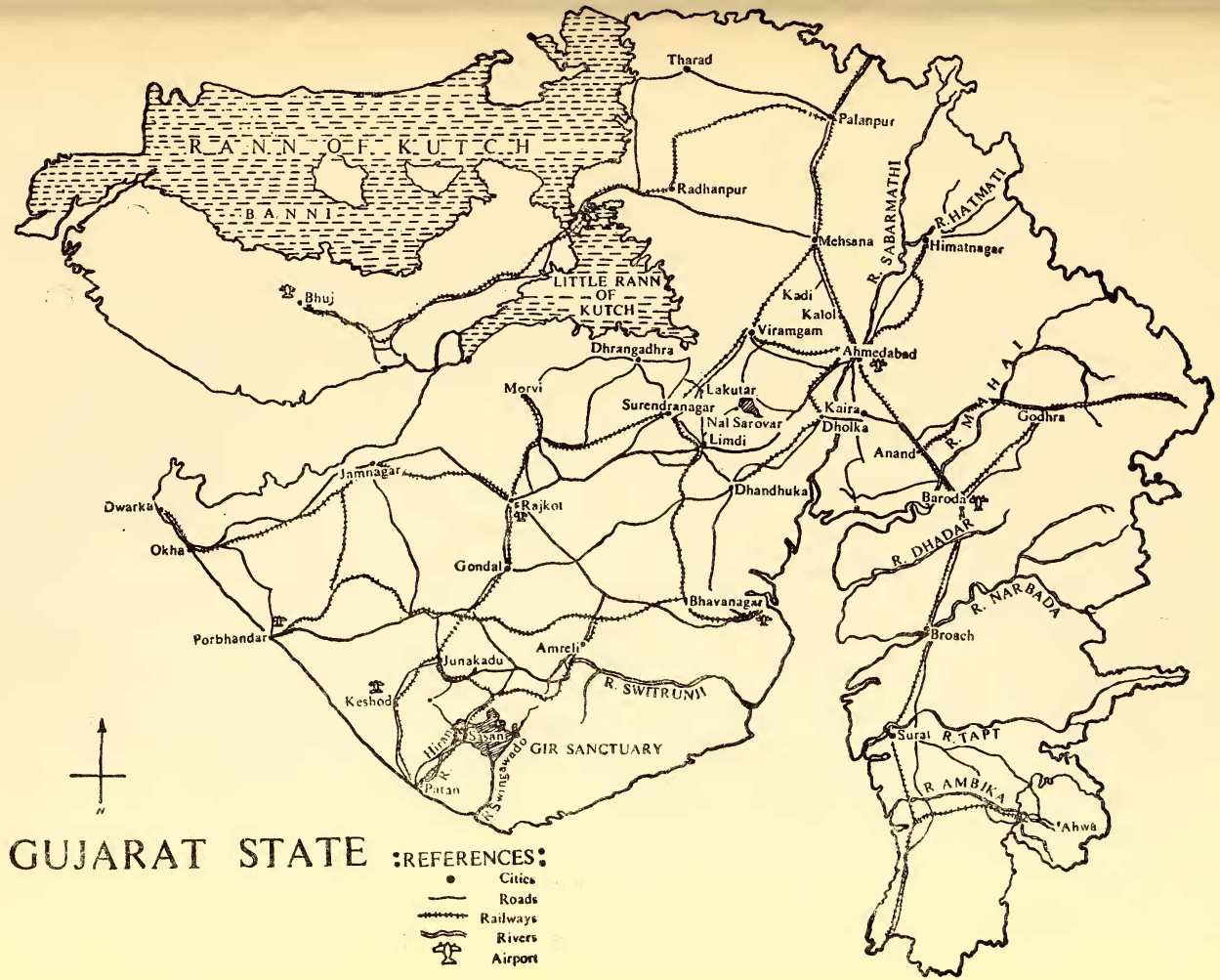
TABLES

I. INTRODUCTION

The State of Gujarat in north-western India comprises three geographical regions : (1) the Kathiawar Peninsula, jutting out into the Arabian Sea and traditionally known as Saurashtra ; (2) Kutch, the lowlands in the north bordering West Pakistan and Rajasthan, including the barren desert wastes of the Little and Great Ranns ; and (3) the mainland of Gujarat, between the rivers Banas and Damanganga. Typical natural vegetation for most of the State is desert scrub. The Gir Forest, a dry deciduous stunted or scrub forest of relatively little commercial value, is the only extensive forest area in this part of Gujarat. Annual rainfall varies between 25 and 50 inches (65-127 cm.) for most of the State. The arid zones of Surendranagar and north Gujarat receive even less. Mountainous regions are comparatively lacking, although steep, barren and rocky hills dominate the skyline in many parts.

Relatively little wild life is presently found in Gujarat. However, the State has the distinction of harbouring three extremely rare faunal species. The Gir Forest in the Junagadh District, is the last stronghold of the Asiatic Lion [*Panthera leo persica* (Meyer)]. The Indian Wild Ass (*Equus hemionus khur* Lesson) is almost completely restricted to the Little Rann of Kutch. The Great Indian Bustard (*Choriotis nigriceps* Vigors) was formerly distributed throughout most of the Indian Union, but now appears to be restricted to a few isolated areas in Gujarat and neighbouring States. In addition, the Great Rann of Kutch is the only known nesting ground in India of the Flamingo (*Phoenicopterus roseus* Pallas).

The last ' census ' of the Gir lions was conducted in 1963. At that time the total population was determined to be about 285 lions. Mr. E. P. Gee undertook a survey in 1962 to determine the status of the Indian Wild Ass. He then estimated a total population of 870 asses, of which all but about 10 permanently resided in the Little Rann. The Great Indian Bustard is extremely rare and apparently on the verge of extinction. Facts concerning its present or even recent distribution and numbers are not available.



GUJARAT STATE

:REFERENCES:

- Cities
- Roads
- Railways
- Rivers
- Airport

GIR SANCTUARY

II. THE GIR WILD LIFE SANCTUARY

Introduction

The Gir Forest covers an area of over 500 square miles (1,334 sq. km.) in the centre of the Kathiawar Peninsula of Gujarat. Over 480 square miles (313,459 acres) of Reserved Forest were officially designated as the Gir Wild Life Sanctuary in September 1965 (Agriculture and Co-operation Department, Notification No. GH-KH/97-WLP/660/62848-P, Sachivalaya, Ahmedabad, 18 Sept. 1965).

Besides being the only extensive forest tract in this part of Gujarat, the Gir is particularly noted for being the last stronghold of the Asiatic Lion. Lions appear to have ranged over the whole of Central Europe in prehistoric times. During historical times they were spread from Greece and Palestine, throughout the Middle East, including Mesopotamia, Persia, and Baluchistan. In India they inhabited practically the whole of the northern and central parts of the country, extending from Sind to Bengal and from the Ganges and Indus to the banks of the Narbada. During the early 1800's they were still abundant in many parts of India, but by the latter part of the century were only sporadically reported from a few areas in northern and western India. It appears that by the early part of the 20th century most of the few Asiatic Lions that remained were confined to the vicinity of the Gir Forest. Measures were finally taken to halt the indiscriminate slaughter of the lion. As a result, their numbers have gradually increased until presently it is claimed that there are about 285 in the Gir Sanctuary.

Rather than keep all their ' lions in one basket ' the Forest Department captured three specimens (one male and 2 females) and released them in the Chakia Forest south-east of Banaras in Uttar Pradesh in 1957. This is within the precincts of the Chandraprabha Wild Life Sanctuary and was reported to be a favourable area for the re-introduction of the lion. Although this attempt did not prove as fruitful as was expected, there are reliable reports of lion being sighted in this area as late as the fall of 1966 and the transplant may yet prove successful.

Ecology

The terrain of the Gir Wild Life Sanctuary consists of steep, rocky hills with deep ravines or *nullahs*. The maximum elevation is 1741 feet above mean sea-level. The primary sources of perennial water are the Hiran, Singoda, Ardak, Machhundra and Rawal rivers. The Hiran passes near the Forest Bungalow at Sasan and the Raval is located in the southern part of the sanctuary. In addition, a number of scattered water-holes provide water during much of the year. These are located

along the rocky *nullahs*, which serve as watercourses for the numerous ephemeral streams. Wells and water troughs have been provided in many parts of the sanctuary by the graziers for their livestock. In 1958 the Kamleshwar Dam was constructed across the Hiran River several miles upstream from Sasan. This normally impounds a several square mile lake, but was practically dry during my visit.

The average annual rainfall in the Gir is normally about 35 inches (889 mm.). However, only 20 inches of precipitation were recorded during 1965 and 17 inches during 1966. Rainfall is monsoonal and, although somewhat irregular, the rains generally begin in early July and end by late October. Occasional showers often occur in January and February, but at least six months of the year are usually completely dry. The maximum and minimum temperatures are 106°F. and 46°F. in May and January respectively. However, temperatures of over 100°F. (37·8°C.) are common during the summer (April-July) and minimum temperatures during the winter (November-March) rarely drop below 55°F. (12·8°C.).

Flora

The Gir is predominantly a dry mixed deciduous forest. Near the extremities it becomes an open thorny scrub type, comparable to the vegetation in many desert areas of the State. Teak (*Tectona grandis*), although poor in size and quality, accounts for over 50 per cent of the tree stand on the better soils. *Babul* (*Acacia arabica*) is also abundant and probably accounts for about 25 per cent of the total tree growth. Other species present include: *sadad* (*Terminalia tomentosa*), *behda* (*T. belerica*), *tendu* or *timru* (*Diospyros melanoxylon*), *haldu* (*Adina cordifolia*), *sissam* (*Dalbergia sissoo*), *khair* (*Acacia catechu*), *karanj* (*Pongamia pinnata*), *siris* (*Albizzia lebbek*), *krangsa* (*A. procera*), *mahuda* (*Madhuca indica*), *anvla* (*Phyllanthus emblica*), *aritha* (*Sapindus emarginata*), *garmala* (*Cassia fistula*), *jamun* (*Syzygium cumini*), *khakra* (*Butea monosperma*), *kudi* (*Wrightia tinctoria*), *aal* (*Morinda tinctoria*), *salie* (*Boswellia serrata*) and some patches of bamboo (*Dendrocalamus strictus*) in moist areas along the *nullahs*. Also, a few Eucalyptus have been planted by the Forest Department. There are few climbers, but thorny bushes or shrubs are commonly intermingled with the trees. These consist primarily of *Acacia* spp., *ber* (*Zizyphus mauratiana*), *guggal* (*Commiphora mukul*), and so forth.

The trees in the Gir Forest, with very few exceptions, lose their leaves during the dry season (December-July). The scattered 'Flame of the Forest' or *khakra* (*Butea monosperma*), *simul* or *semal* (*Bombax ceiba*, formerly *Bombax malabaricum*), and *kadaya* or *karaya* (*Sterculia urens*) are then particularly evident because of their bright red blossoms, which contrast markedly with the stark absence of leaves.

Fauna

Bird life is abundant in the Gir Sanctuary and most of the species found here are ably described in K. S. Dharmakumarsinhji's book BIRDS OF SAURASHTRA (1955). Among the more obvious birds observed during my short visit were : Bonelli's eagle, crested hawk eagle, white scavenger vulture, whitebacked vulture, Indian pond heron or paddy bird, Indian black ibis, common grey partridge or francolin, Indian roller, cattle egret, wood sandpiper, redwattled lapwing, Indian roseringed parakeet (nest in the Forest Bungalow), Indian spotted dove, peafowl, common green bee-eater, hoopoe, blackheaded cuckoo-shrike, Dharmakumars' small minivet, drongo, Indian brownbacked robin, Indian magpie robin, redbreasted flycatcher, jungle crow, treepie, jungle babbler, redvented bulbul, pied bushchat, yellowheaded wagtail and common myna.

Reptiles present in the Gir Sanctuary include ; common cobra (*Naja naja*), Indian python (*Python molurus*), monitor (*Varanus* sp.), mugger (*Crocodilus palustris*), as well as undetermined species of lizards and turtles. A number of small species of fish were also observed in the Hiran River, but none of these would be of importance either commercially or for sport.

Mr. P. K. Pandya, the Tourist Department Receptionist at Junagadh, has been conducting tours to the Gir since January 1964. During his numerous visits to the sanctuary he has observed many species of mammals and has become acquainted with their local or gujarati names. With his aid a table was compiled listing the mammals of the Gir Wild Life Sanctuary and their local names (Table 1).

Visitor Facilities

The nearest airport to the Gir Wild Life Sanctuary is at Keshod, 42 miles (67 km.) by jeepable road north-west of the Forest Bungalow at Sasan. A better road is via Veraval, 61 miles. Four flights per week (Sunday, Tuesday, Thursday, and Saturday) arrive at Keshod from Bombay. Transportation to Sasan and return may be arranged by prior notification to the Sanctuary Superintendent. Sasan may also be reached by overnight metre-guage train from Ahmedabad, via Khijadia Station. The railway station at Sasan is only several hundred yards from the Forest Bungalow. Regularly scheduled Tourist Department tours of the sanctuary may likewise be taken from Junagadh, approximately 50 miles north of Sasan via Mendarda.

The Forest Bungalow at Sasan has 16 double rooms and modern facilities, including electricity. Both food and lodging are provided at nominal fees. A dormitory that can accommodate up to 40 people was added recently to the facilities at Sasan. Reservations for food and/or lodging at Sasan and transportation to and within the sanctuary should

be made by writing to the Sanctuary Superintendent in Sasan-Gir at least two weeks prior to arrival. Two vehicles are presently provided

TABLE 1

NAMES OF SOME OF THE MAMMALS INHABITING THE GIR WILD LIFE SANCTUARY, GUJARAT

English	Local or Gujarati	Scientific
Common Langur	Vandara	*Presbytis entellus*
Asiatic Lion	Untia Bagh (camel tiger) Sinha (male) Sinhan (female)	*Panthera leo persica*
Leopard or Panther	Dipado (male) Dipadi (female)	*Panthera pardus*
Jungle Cat	Bilado (male) Biladi (female)	*Felis chaus*
Small Indian Civet	Vaniyar	*Viverricula indica*
Common Mongoose	Noliyo	*Herpestes edwardsi*
Striped Hyena	Jarakh	*Hyaena hyaena*
Wolf	Varu	*Canis lupus pallipes*
Jackal	Siyal	*Canis aureus*
Indian Fox	Lonkadi	*Vulpes bengalensis*
Ratel or Honey Badger	Ghorkhodiya	*Mellivora capensis*
Five-striped Palm Squirrel	Khisakoli	*Funambulus pennanti*
Indian Porcupine	Shahudi	*Hystrix indica*
Indian Hare	Sasalu	*Lepus nigricollis*
Chinkara or Indian Gazelle	Shikara	*Gazella gazella*
Blackbuck or Indian Antelope	Kaliyar	*Antilope cervicapra*
Four-horned Antelope or Chousingha	Ghatudu	*Tetracerus quadricornis*
Nilgai or Bluebull	Rose (male) Rasadi (female)	*Boselaphus tragocamelus*
Sambar	Sabar	*Cervus unicolor*
Chital or Spotted Deer	Tipkivalaharan	*Axis axis*
Indian Wild Boar	Suvar	*Sus scrofa*
Indian Pangolin	Salvo	*Manis crassicaudata*

for the use of visitors. Most of the sanctuary's 300 miles of roads are metalled and are maintained by the Forest Department. Although the sanctuary can usually be reached throughout the year, travel sometimes becomes difficult on these fair-weather roads during the monsoon (July-October). Crossing on some of the ravines or *nullahs* become particularly uncertain. A tar road leads from Veraval to Talala, 14 miles south of Sasan, as well as from Junagadh to Veraval via Keshod. The next closest tar road ends at Mendarda, 24 miles north-west of Sasan.

The best season for visitors to the Gir is from January until May. Weather conditions are rather uncertain during June. Although good weather can generally be expected during November and December, because of the high grass and dense undergrowth, the animals are usually rather difficult to observe during these months. The best time to see the maximum number of wild animals is during the dry season. However, temperatures from April until the monsoon breaks in late June or early July often exceed 100°F. (38°C.).

The ' lion shows ' are the outstanding attraction in the Gir Sanctuary. These are scheduled for a minimum fee of Rs. 80 per group of from 1 to 8 visitors. Each additional person is charged Rs. 10. On the second Sunday of each month the fee is Rs. 10 per person, regardless of the number of visitors in the party. Prior to July 1966 the minimum fee was Rs. 150 per ' lion show ' for each group of 20 or part thereof. The number of ' lion shows ' presented to visitors increased from 192 in 1963 to 236 in 1964 and 292 in 1965. The number of visitors recorded by the Forest Department varied from 3,645 for 1963-64 to 3,530 for 1964-65 and 4,377 for 1965-66. The decrease in 1964-65 can be attributed to the Indo-Pakistani conflict. In all cases less than 10 per cent of the total were foreigners. Tourist Department tours from Junagadh also brought over 2,000 Indian and 240 foreign visitors to the sanctuary in 1965.

Twelve ' shikaris ' are permanently employed in the Sanctuary to track or locate lions for visitors. The ' shikaris ' are assigned regular beats and during the morning attempt to locate groups or prides of lions within a 15-mile radius of Sasan. If necessary, they lead the lions with a bait to an area more easily accessible to visitors. Then, during the afternoon or early evening, they guide the visitors to the lions. The ' shikaris ' are excellent trackers and claim to ' know ' about 30 individual lions within the vicinity of Sasan. These lions can usually be observed and photographed by visitors on foot at distances of less than 50 feet.

The historic temple of Somnath near Veraval is of interest, as well as the two near-by holy places of the Hindus—Bhalka Teerth and Dehotsarga. The earthly remains of the most popular God of the Hindus, Lord Krishna, were supposed to have been cremated here. Three Hindu temples are also located in the Sanctuary. Satadhar is approximately 16 miles north-east of Sasan. Kankai is about 17 miles south-east. And Tulsishyam is also south-east about 50 miles. Free board and lodging are reportedly provided for pilgrims to these shrines.

Forest Department personnel assigned to the Gir Wild Life Sanctuary and charged with assisting and providing for the needs of visitors consist of a Sanctuary Superintendent assisted by other officers and staff totalling 42.

Discussion

The Gir Wild Life Sanctuary presents one of the most interesting wild life areas in India. Besides being the last stronghold of the Asiatic Lion and the only extensive forest area in this part of Gujarat, its numerous faunal forms are impressive and deserve major consideration. It is true that some of the lions prey upon domestic livestock. However, other wild animals, such as deer, antelope, and pig, form the basic food

supply for the lion and without their presence in fair numbers the survival of the lion would be highly jeopardized. Thus, the preservation of the Gir lions entails the proper management of all the sanctuary's wild life, including the floral as well as faunal forms.

The 1965 Act which designated the major portion of the then Gir Reserved Forest as a wild life sanctuary is highly commendable. However, as was recommended by the Indian Board for Wild Life in 1963, it is hoped that shortly the Gir will be upgraded to the official status of a national park. This action of merely converting the status of the sanctuary would provide two basic advantages. First, a national park necessitates an Act of the State Legislature and can only be unmade by an Act of that legislature. On the other hand, a sanctuary can be formed by a gazette notification and can as easily be unmade. Therefore, a national park is much more immune to adverse changes in policies and to political expediency. Second, designating an area as a national park gives it greater prestige and indicates, particularly to foreign tourists, that it is an area of national significance. The Gir has the potential of being one of India's outstanding national parks and this potential should be realized as soon as possible.

The ideal faunal national park is as free as possible from human activities, such as settlements, cultivation, forest exploitation, livestock grazing and so forth. These problems will be discussed briefly. However, it does not follow that because some of them are present in an area it cannot become a national park.

Cultivation

The present human population within the confines of the Gir Wild Life Sanctuary, in my opinion, is not excessive. Although located in the Gir Forest, 3,000 acres belonging to the Dharmada Institution of Tulsishyam and 863 acres pertaining to the villages of Sasan, Najanpur Chhataria, Karasangadh and Gundiyah were excluded from the sanctuary when it was established in 1965. Of the latter 863 acres, 87 pertain to village sites and 776 are cultivated lands. These lands have been demarcated and are limited to their present size.

Major crops are cotton, millet, corn or maize, and wheat. The soils in this region are rocky and for the most part can probably be classified as submarginal agricultural lands. Therefore, there is little justifiable reason to permit additional lands to be cleared for cultivation. If the cultivated areas are strictly limited to their present confines, they should not be a deterrent to the establishment of the Gir Sanctuary as a national park. Probably of greater significance than cultivation are other practises of the people within the sanctuary, such as the grazing of livestock, the use of ' crop protection ' guns and the occasional use of poisons or other means for killing lions and other wild life.

Livestock Grazing

In addition to permanent village sites, temporary villages or camping places called ' nesses ' are common throughout the Gir Sanctuary. Graziers or ' maldharis ' centre their extensive livestock grazing operations around these. Some of the sanctuary's principal ' nesses ' are Kansia, Sandhbeda, Devalia, Kapuria, Gadakia and Dedakdi. Although their number is presently specified, they may be shifted from one site to another by permission of the Range Forest Officer.

It is estimated that there are over 500 families of ' maldharis ' in the Gir and that they graze over 15,000 head of livestock. Goats and sheep, with the exception of a special permit for about 200 goats near Sasan, are supposedly prohibited. However, I counted over 300 head in two flocks west of Sasan. The number of cattle or buffalo is not specified. The only requirement is that a very nominal grazing fee for adult animals (50 paise per adult buffalo and 25 paise per adult cow) must be paid to the Forest Department. Young or immature animals are permitted free of charge. There are no further restrictions as to the number of cattle or buffalo that are grazed, as long as the grazing fees are paid.

Where there is good grazing for wild ungulates there is also good grazing for domestic livestock. If domestic livestock grazing cannot be excluded from an area dedicated to the preservation of wild life, then the problem is to reconcile the two diverse objectives. This demands that grazing be controlled and regulated under a policy of wise land use. And, in most cases, this means a reduction in the number of domestic animals. There were some areas observed in the Gir which appeared to be almost completely untouched by domestic livestock. However, almost without exception, areas surrounding the permanent villages and ' nesses ' were severely overgrazed for considerable distances into the forest. The recent and prolonged drought is undoubtedly a factor to be considered. Nevertheless, in any case the carrying capacity of the forage should never be exceeded. Forage resources should be carefully and periodically evaluated and measures then taken to ensure that the carrying capacity is not surpassed by either domestic or wild ungulates.

When nature is abused she often retaliates with drastic actions. Once choice lands throughout much of the world are now barren and rocky deserts because of the abuses of man and his livestock. Particular care must be exercised in arid areas, such as the Gir Forest. Only a year or two of excessive overgrazing in such areas may result in habitat destruction that may take nature a century or more to repair—even with complete protection.

Good forage conditions will result in better production of both milk and work by domestic animals, as well as help to maintain the animals in a healthy and vigorous condition. The incidence of diseases and parasites in both domestic and wild animals likewise will be reduced.

Also, the maintenance of good numbers of wild ungulates will reduce the number of domestic animals taken by lion. This in turn will reduce the amount of compensation that the Forest Department has to pay to villagers or 'maldharis.' Thus, Rs. 7000-8000 per year, paid for livestock compensation during 1965, could be put to better use in developing the sanctuary. In short, there is much to be gained through proper land use, which includes the control of livestock numbers. But, literally all can be lost if the present trend of ever increasing numbers of domestic livestock is permitted to continue.

Forest Exploitation

Wild life is an integral part of any natural forest. As such it deserves full consideration in all forest operations or exploitation. Forest management involves wild life management and vice versa. Under proper management both the forests and their wild life are managed so as to provide the greatest benefits to all concerned over a sustained period of time. Nevertheless, proper management will vary remarkably from one area to another. For example, forest produce will rightfully receive prior consideration in some areas, while wild life may be considered only as a by-product. In other areas, particularly those set aside as wild life sanctuaries or national parks, the wild life should receive major consideration and the forests in many cases may not be exploited at all for produce. Generally speaking, however, the relative values of forest produce and wild life should be carefully considered. Then, in so far as is possible, both should be managed on a sustained yield basis.

The forests of the Gir Sanctuary are extensively exploited for produce. Although very few of the trees have much commercial value for lumber, they are utilized primarily for fire wood and small timber, which is used for light construction. Selected ' coupes ' are clear-felled and frequently replanted with teak. Livestock grazing is prohibited for several years on these recently cleared or teak plantation ' coupes ', but grass cutting is permitted on a contract basis. Minor forest produce is also of importance and includes such items as wild fruits, soap nuts, ' tendu ' leaf (used instead of paper for rolling cigarettes), gums, wild honey and so forth. These are usually collected on a permit basis by people living in or near the sanctuary.

I feel that it is impractical and illogical to advocate the cessation of all forest exploitation in the Gir Wild Life Sanctuary. However, the wild life should receive major consideration and all forest exploitation should be managed so as to interfere as little as possible with the function of the area as a wild life sanctuary.

It would be desirable if the Forest Department would demarcate and maintain a fairly extensive area free from all forest exploitation, including the grazing of domestic livestock. In other words, an inviolate

'Sanctum Sanctorum', which would provide a refuge for wild animals where they should be relatively immune to the disturbances of man. Preferably, this would be within the vicinity of the Forest Bungalow at Sasan. It would also permit visitors to view the unique wild life of this region in almost a pristine setting.

Poaching

The extent to which poaching is a problem in the Gir Wild Life Sanctuary is not known. It is difficult even to assess the severity of violations in an area as complex as the Gir. First, the Gir covers over 500 square miles of steep rocky terrain. Then, there are over 300 miles of roads within this area. These are used extensively as a thoroughfare or for removing produce from the forest, as well as by local villagers with their bullock carts and livestock. Thirdly, villages or 'nesses' are distributed throughout the forest and 'maldharis' and their livestock are found almost everywhere. The Forest Department staff is limited. Even if it were not, it would not be economically feasible continuously to patrol this vast area. Complex as the situation is, practical measures should still be as fully implemented as soon as possible to halt poaching and other illegal activities in the Gir Sanctuary.

The sanctuary staff claims that the most common form of poaching is from vehicles along the roads. Therefore, road blocks and periodic inspections of all vehicles passing through or leaving the sanctuary, particularly at night, would probably help to check violations of this type. Farmers within the sanctuary have 'crop protection' guns in their possession. These villagers should be made to understand that these guns are to be used only for their intended purpose and then only on private lands. Even the carrying of arms in the sanctuary proper should be considered as an offence. Likewise, except during the crop season, the use of 'crop protection' guns should be completely prohibited.

The use of pesticides or poisons by villagers to kill lion and other carnivora has been greatly reduced by a livestock compensation policy. Since 1964 the Forest Department has paid compensation for livestock killed by lions. When an animal is killed under particular circumstances, i.e., livestock must be corralled at night and accompanied by a herder while in the forest during the daytime, the owner must report the incident to the Forest Department. The Range Forest Officer must then inspect the kill to ascertain that it is a bona fide claim and to assess the true value of the animal. He then sends a claim to the Divisional Forest Officer, who reimburses the villager or 'maldhari' for his loss. The value of animals killed is based upon their utility and is said to be about half of what the owners generally claim. An average of between Rs. 250 and 300 per animal or a total of over Rs. 7000 was paid on claims during 1965.

All claims for livestock losses should be dealt with as fairly and as

quickly as possible so that the former methods of predator control will not be reverted to. The Forest Department should also work closely with the Agriculture Department to ensure that toxic materials are not indiscriminately distributed to villagers. Although the particulars were not available, it was reported that there were two or three cases of pesticides (including rat poison) being used to kill wild life in the Gir in 1965. There should be little reason for such incidents in the future if villagers are made aware of the policy of remuneration and if claims are justly dealt with. Nevertheless, precautions should be taken to ensure that they do not arise.

Three lion cubs were reported killed in August 1966. It was reported that villagers stoned and then drove their buffalo over the cubs, but this could not be proved. Another report stated that only one lion cub was killed. Therefore, the case could not be prosecuted. Laws should always be practical and just. Then the common people should be informed as to what the laws are, how they will benefit by abiding by them and the punishment involved in their violation. When evidence is sufficient, law breakers should also be prosecuted to the fullest extent of the law so as to serve as a deterrent to future infringements.

Each of the 12 ' shikaris ' or Game Keepers employed in the sanctuary is provided with an ancient muzzle-loading rifle. These arms are supposedly for the protection of visitors. However, those which I inspected probably provide little more than a false sense of security. These weapons should either be completely discarded or replaced with modern rifles that would effectively protect a visitor should, for some reason, a usually docile lion suddenly becomes violent.

Shots were heard on two occasions during my first visit to the Gir in 1965 and once in 1966. While investigating one of these a ' shikari ' came out of the bushes from which I had heard the shot. I was unable to communicate with him and I never did determine whether or not it was he that had fired the shot and if he had, for what purpose. This, however, raises a point. Muzzle-loaders use black powder, which is quite readily obtainable. Cartridges, on the other hand, are carefully controlled and accurate records of their sale are kept on file. Therefore, if the Forest Department replaced their muzzle-loaders with modern arms, their use could easily be checked.

Leopards are relatively common in many parts of the Gir. Although only infrequently seen, they are reported to visit Sasan and other villages almost nightly. On the other hand, lions rarely enter the villages. Leopards are also noted for being particularly fond of goats and dogs. Concerning the latter, the villagers in Sasan claim that because of their fear of leopards the dogs in the village take refuge at night either in the houses or on the roofs. What advantage a dog on a roof would have as compared to the climbing ability of a leopard I do not know. But I did

observe that although there were numerous dogs around the village during the daytime, they all seemed to disappear at night. This is rare in Indian villages where dogs are commonly underfoot no matter what the time of day. The villagers further claimed that leopards are probably the greatest enemy of young lions and that lion cubs are killed by leopards whenever they have the opportunity. If after careful investigation this proves to be the case, the Forest Department in some cases might be wise to control leopard numbers.

Fire

The Gir Forest is almost completely dry for at least six months of the year. During this period fires often become a problem. The primary sources of fire are sparks from the coal-burning trains, which pass through the sanctuary, and villagers or ' maldharis ', who sometimes set fires with the belief that it will improve grazing conditions during the coming year for their livestock. Some fires also appear to be accidental. The only means presently available for bringing these fires under control is the use of the sanctuary staff to fight them. An extensive area north of Sasan had burned prior to my arrival. As a result, the ground was completely barren and would not provide any forage or habitat whatsoever for either domestic or wild animals for at least another six months.

The Forest Department, during recent years, has wisely initiated a controlled burning programme along the railroad right-of-way. This has greatly reduced the number of fires from this source. Although almost any burning in an area as arid as the Gir is undesirable, it is a matter of limited burning under controlled conditions early in the season with relatively few adverse effects versus the possibility of devastating and extensive fires later. Villagers and ' maldharis ' should be indoctrinated as to the deleterious effects of burning and discouraged from setting fires in the forest. Those that maliciously set fires should be punished.

Wild Life Management

It has been demonstrated that it is practically impossible to eliminate completely some animal species from their natural habitats so long as they are provided near ideal conditions in abundance—including food, water, cover, and other necessities. Regretfully, the lion is not one of these species. His behavioural and other characteristics make him extremely vulnerable to modern man with the means of destruction which he has at his command. The lion in his natural state had no reason to fear any of the other animals. As a result he did not develop a secretive or silent attitude as is so common with many mammals. He also found that ' in unity there is strength ' and that his needs for food could be more readily acquired with the assistance of others of his kind. Thus he became a social animal and is only infrequently found

alone. However, both his lack of fear and his social nature in the presence of man have helped to eliminate him from the greater part of his former range. Now that man has shown his ' prowess ' in eliminating the lion from the whole of Europe and almost the whole of Asia, is it not time that he showed his benevolence to the remnants of this great beast? Without the aid and protection of man, the mere existence of the lion is imperilled, even in its last remaining stronghold in Asia—the Gir Wild Life Sanctuary.

The management of wild life is critically dependent upon available resources. Therefore, the first step in proper management in a wild life sanctuary is usually a wild life inventory or census. This may be simply a survey to discover what species are present in the area, regardless of numbers. Or it may be an enumeration, as well as a determination of the sex and age class composition of the species. The collection of such data is dependent upon the availability of trained man-power.

Forest Department personnel assigned the responsibility of managing a wild life sanctuary should be carefully selected. Only men with a genuine interest in wild life should be chosen. If at all possible, they should have at least some training in the basic concepts of the specialized field of wild life management. Sanctuary staff members, particularly senior members, should also be appointed for sufficient periods of time so that they can become intimately acquainted with the wild life and the problems in the areas under their jurisdiction. Likewise, they should have sufficient time and authority to remedy the problems which they may encounter and to initiate long-range improvement or management plans. The present Sanctuary Superintendent in the Gir has been posted less than a year and the Sanctuary Inspector just over a year. All too often men are transferred to other positions before or shortly after they have become oriented to the overall situation and prior to the time that they have been able to make genuine contributions to the management of their areas. Literature concerning wild life management should be made available within the sanctuary and the staff encouraged to become acquainted with it. The staff should also consult and work with wild life experts whenever the opportunity arises.

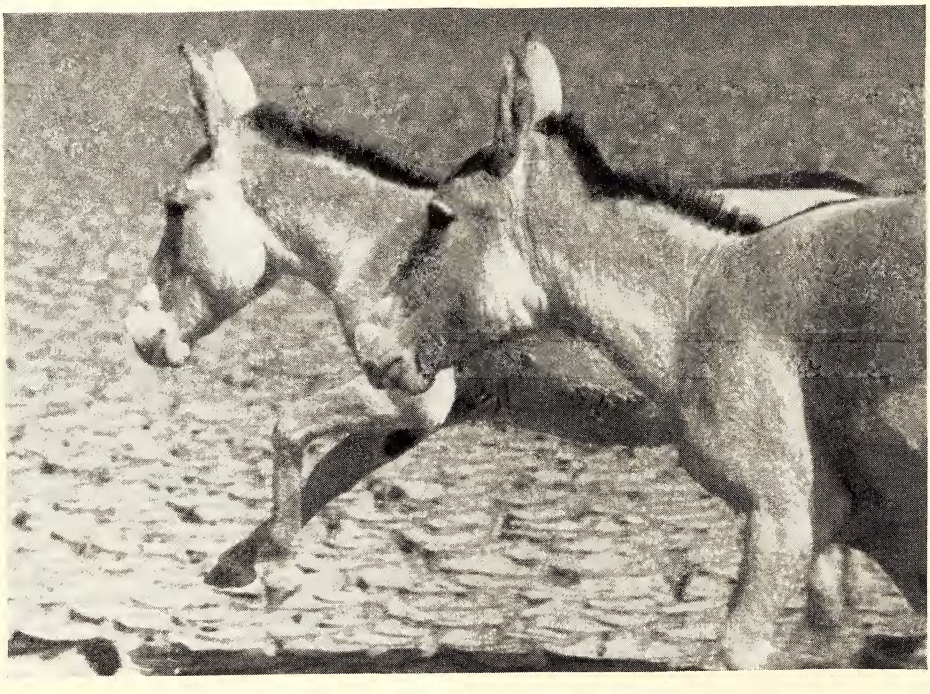
According to Forest Department reports the total lion population of the Gir was less than a dozen in the early 1900's. However, according to the Jam Sahib of Nawanagar, as reported by Gee (1964), the lowest number was probably not less than 100. The shooting of lion was finally prohibited in 1913, although official permits were still given to V.I.P. s to shoot specified quotas of lions. Fortunately this custom has been stopped and lions, as well as all members of the deer family, are now fully protected by the Government throughout Gujarat.

The first lion census in the Gir was conducted in 1936 and resulted in a total count of 287 lions. Further censuses carried out in 1950, 1954,

Spillett : Wild Life Surveys

Above : The "shikaris" in the Gir Wild Life Sanctuary claimed that this adult male lion, whom they called "Bhuria" was about 9 years old ; *Below :* An adult lioness "Mala Sinha" reported by the "shikaris" to be about 7 years old.

(*Photos : Author*)



Above : A herd of Indian Wild Asses at the edge of the Little Rann Kutch ;
Below : Close-up of two Indian Wild Asses running at a speed of over 30 miles per hour in the baked-mud surface of the Little Rann.

(*Photos : Author*)

and 1963 determined the populations at about 227, 290, and 285 respectively. The sex and age class composition break down for the latest figure of 285 was 82 adult males, 134 adult females, and 69 young.

Lion enumerations in the Gir have been supervised by the late M. A. Wynter-Blyth, formerly principal of the Raj Kumar College at Rajkot. Mr. R. S. Dharmakumarsinhji, a notable authority on wild life, has also assisted. A method of counting tracks was employed in all cases. This was based upon three facts or assumptions : (1) Different lions can be identified by the pug marks of their front feet, i.e., the tracks of any two lions can usually be distinguished. (2) Lions generally walk along paths or roads through the forest, rather than cross-country. (3) Lions drink at least once during every 24-hour period. This is basically a sound method and should give fairly reliable estimates as long as enumerations are carefully planned and executed with well-trained personnel. However, without expert trackers and strict supervision the results may be subject to gross errors.

A number of reliable people of Gujarat who are well-versed in wild life have expressed the opinion that instead of 285 lions in the Gir Sanctuary there are probably only about 100 to 150. I am likewise of the same opinion. Although I saw only 14 different lions during my short visit to the Gir, I base my opinion primarily upon the relative scarcity of prey species which I observed. For example, during my 4-day visit I travelled over 250 miles by jeep inside the sanctuary. Most of this was during the early morning or evening when the opportunities for seeing wild life are generally quite good. However, the sum total of my observations were : 20 chital, 9 wild pig, 5 sambar and 11 four-horned antelope. Chinkara, nilgai or blackbuck were neither observed during my 1965 or 1966 visits. The ' shikaris ' also claim to be acquainted with only about 30 lions within about a 15-mile radius of Sasan. Many of these prey upon domestic livestock. In my opinion, prey populations in the Gir presently do not appear to be large enough to support even 200 lions, let alone 300. Enumerations of prey species in the Gir have been grossly neglected and, in so far as I am aware, have never been attempted. The Forest Department has been conducting their lion censuses at approximately 5-year intervals. It would be commendable if enumerations of other species, such as chital, sambar, etc., were conducted at the same time. The results would be of interest and of value if the enumerations are properly conducted. It would also be interesting to compare the results of a ' direct count method ' with lion, as advocated by M. A. Rashid, Conservator of Forests in Gujarat, as compared to the previously employed ' track count method.'

Other forms of wild life in the Gir Sanctuary should not be neglected. In addition to periodic enumerations of lions and other large mammals, checklists of birds, reptiles and smaller mammals in the sanctuary should

be compiled and made available both to the staff and to visitors. Likewise, wild life observations by both visitors and staff should be systematically recorded and kept on file inside the sanctuary. Scientific investigations concerning the sanctuary's wild life by qualified investigators should be encouraged. Their findings should be utilized in formulating management plans, as well as made available to the general public.

General maps depicting roads and places of interest in the sanctuary should be made available to visitors, as well as detailed maps depicting vegetation types, etc., for the staff and scientific investigators. Postcards, folders, booklets and other general information and propaganda should be compiled and distributed through the Tourist Department and other agencies so as to help people become aware of what the sanctuary has to offer. Preferably these should be sold at reasonable rates and would prove as an additional source of revenue for the sanctuary. Lions are admittedly the Gir's outstanding attraction, but its other attractions should not be overlooked. For example, many people would be interested in seeing mugger or crocodile in the Kamleshwar Lake or the Hiran River, as well as other wild life species, such as the four-horned antelope, chital, sambar and so forth. The near by temples or even some of the ' nesses ' may be of interest, particularly to foreign visitors.

The Forest Department of Gujarat is to be commended for its role in the preservation of the Gir Forest as a Wild Life Sanctuary. A firm base for future management has already been established. The task now is both to maintain and improve upon this base so that the Gir will attain its full potential and the distinction of being one of India's outstanding wild life areas, which it rightfully deserves. The ultimate goal should be perpetually to protect and preserve the wild life of the Gir, while at the same time providing as many people as possible the unique experience of observing wild life in its natural state.

III. THE WILD ASSES OF THE LITTLE RANN OF KUTCH

Introduction

The Indian Wild Ass apparently was once common in much of north-western India and what is now West Pakistan and south-eastern Iran, formerly known as Persia. It is now extinct in Iran and, with the exception of a few animals which may occasionally stray into south-eastern West Pakistan, it is presently restricted to the Little Rann of Kutch. Concerning its near relatives, Talbot (1960) considered the Syrian Wild Ass (*Equus hemionus hemippus* I. Geoffroy) as extinct and claimed that the wild asses of Egypt, the Sudan and other parts of Africa are probably feral rather than true wild asses. Sálim Ali (1946a) reported that in

1945 the Kiang or Tibetan Wild Ass (*E. h. kiang* Moorcroft) was common or abundant on the 15,000 foot-high Barkha Plain and in the neighbourhood of the lakes Manasarowar and Rakhas Tal in western Tibet. However, since the Chinese invasion little is known about the status of this species.

Valuable information concerning the Indian Wild Ass also was reported by Sálim Ali in 1946 when he conducted an expedition to the Little Rann. Wynter-Blyth (1956) described how six asses were captured for the Indian Army to be used for breeding purposes with mules. However, I have been unable to find out the results of this project. Dharmakumarsinhji (1959) likewise described the wild ass and presented observations concerning it and possible methods of censusing its numbers. In 1960 Sálim Ali reported the death of a number of asses to E. P. Gee. Some deaths of wild asses in 1958 were confirmed to be a result of surra[1]. Further deaths from surra in 1960 and the report of an epidemic of African Horse Sickness[2] in November and December 1961 prompted E. P. Gee to undertake the first real survey to determine the status of the Indian Wild Ass. This survey was initiated in February 1962 under the auspices of the IUCN (International Union for the Conservation of Nature and Natural Resources) and the World Wildlife Fund. The present report is a continuation of the survey initiated by E. P. Gee.

The Little Rann

The Little Rann of Kutch in north-western Gujarat has to be seen to be believed. Weird mirages are continually visible in this flat sterile desert which covers an area of approximately 1,000 square miles. Although a vast barren waste, the Rann has a unique enchantment. Heat shimmer in the intense sunlight of the dry season (October-June) obscures anything beyond about half a mile. Visible objects beyond several hundred yards often appear to float in the air and assume peculiar shapes. Wild asses often appear to be walking in a shimmering sea with their reflections mirrored below. Many objects are also greatly magnified and take on grotesque proportions. For example, we once sighted what appeared to be a long line of large animals in the distance.

[1] Surra—an arthropod-borne disease of horses and other animals caused by a protozoan blood parasite *Trypanosoma evansi*. The disease is usually fatal to horses unless an injection of arsenical preparations is given. Prophylactic doses give an immunity of about six months. Common vectors are horse-flies of the family Tabanidae.

[2] African Horse Sickness—a virus disease of equines which has been known for a long time in Africa. However, in recent years it spread across the Middle East and first entered India in either 1959 or 1960. It is generally transmitted by biting midges of the genus *Culicoides*. Horses may be made immune to the disease for periods of about six months by inoculation. Those which recover from the disease are also immune.

Approaching closer with the jeep these figures assumed major proportions and appeared much like a series of large block houses. Finally, upon closer examination it was determined that they were nothing more than the tracks of wild asses and the irregularities caused when they crossed the table-flat desert surface when it was muddy.

Only a few scattered hillocks or islands, locally called ' bets ', break the monotony of the flat, salt-cracked terrain of the Little Rann. The largest of these is the somewhat centrally located 18 to 20-square-mile Pung Bet. Sâlim Ali considered this 'bet' as the 'headquarters' for the Indian Wild Ass during his 1946 expedition. However, he also stated that the relatively small ' bets ' of Vachhda and Jhilandan were probably the only source of perennial water within the Rann and the asses shifted to them from Pung Bet about the middle of March. Other ' bets ' include Nanda, Mardakh or Merdhak, Kesmari and Zilanand or Jalander, as well as a number of smaller ' islands '.

Rainfall in this region is only 5 to 15 inches per year. A number of rivers, such as the Banas, Rupen, Bambhan and Mechhu, flow into the Rann, but then they disappear below the surface. However, during the monsoon season (July-October) and for a few months thereafter the flood waters of these rivers combine with the waters blown up from the sea by the strong winds from the south-west. Much of the Little Rann, which is only a foot or two above mean sea-level, then becomes flooded and forms somewhat of an estuary to the Arabian Sea. Although parts of the Rann are never completely dry, by November or December extensive areas have a caked and salty crust upon which vehicles can safely travel until the monsoon again commences. The flat, cracked surface actually provides a ' super highway ' during most of the dry season upon which vehicles can smoothly and safely travel at high speeds, as long as the darker or softer patches are avoided.

Vegetation

The wild asses habitually forage at night upon the 'bets' or the shores of the Little Rann. Then during the daytime they retire to the desert wastes. With the exception of the ' bets ', there is no vegetation in the Rann because of the impregnation of salt and other compounds. The sparse vegetation of the ' bets ' consists primarily of low scattered trees, mostly *babul* (*Acacia arabica*) and some grasses, such as *kharib* (*Aelurops villosus*). Staple grasses along the shores of the mainland include *thegado* (*Cyperus capillaris*), *dabhado* (*Eragrostis cynosuroides*), *zinzvo* or *jinjro* (*Andropogon* spp.) and *chaktadun* (*Eragrostis amabilis*). Nearby cultivations also contribute to the diet of the asses during the crop season. According to Gee (1962) they raid, in order of preference, the following crops : gram, wheat, cotton, millet, and *jowar*. These crop depredations may be influenced by the apparent lack of other

suitable forage. Nevertheless, all of the asses which I observed were robust and appeared to be in good condition—a marked contrast to emaciated domestic animals in the same areas.

A wealthy land owner living in Ahmedabad, but with extensive holdings near Kharaghoda and Patadi, petitioned the Government in the spring of 1966 to reduce the number of wild asses because of crop depredations. However, Forest Department personnel reported that when the local Divisional Forest Officer met this man and explained the importance and need for protecting this unique species, he withdrew his petition.

The planting of mesquite (*Prosopis juliflora*), locally called *vilayatibaval*, was initiated along the fringes of the Little Rann in 1954. These trees were originally introduced from Mexico, although some seed stock has also been obtained from the south-western United States. Seedlings are being planted along the shores of the Rann primarily to prevent the spread of the desert, but also to improve the soil fertility and to provide a wind-break and firewood.

Small trenches about three feet long, a foot or two wide and about a foot deep are dug at 15-foot intervals in selected sites during the dry season. Seedlings are then planted at the start of the rainy season. Some plantings do not take, particularly in areas that become flooded during the monsoon. However, the majority of the trees grow quite rapidly and many exceed 20 feet in height in about 10 years. Although domestic and wild ungulates, with the exception of goats, rarely feed upon the mesquite bushes or trees, the dry seed pods appear to be relished. As a result, seeds disseminated through the animal's droppings have planted additional areas, which in some cases are relatively distant from the plantation sites. The Forest Department has planted an average of about 2,000 acres per year since the initiation of the programme. Thus, the total area of mesquite plantations along the edge of the Little Rann now exceeds 22,000 acres.

Fauna

In so far as wild life is concerned, the Indian Wild Ass is the predominant species in the vicinity of the Little Rann. Blackbuck, chinkara and nilgai were formerly abundant along the shores of the mainland. Sálim Ali observed some blackbuck during his 1946 expedition, but claimed even then that they had been all but exterminated in many parts of the Rann and Gujarat where they were abundant only a few years previously. In 1962, E. P. Gee observed only a single 'frightened' blackbuck in the vicinity of Zilanand Bet and two or three nilgai on the mainland. We observed no blackbuck, but saw two chinkara and four nilgai in the Rann north-west of Tikar. However, we witnessed the ruthless gunning down of one of these by some 'sportsmen' in a jeep

and had the unpleasant task of apprehending the culprits. Except for wild asses, no other wild mammals were observed within the vicinity of the Little Rann.

Domestic livestock numbers, on the other hand, are excessive along the fringes of the Rann. Large herds of cattle were frequently encountered, as well as flocks of sheep, goats, and donkeys. With very few exceptions, all the areas which we visited were severely overgrazed. A lack of forage was already evidenced by the condition of most of the animals and it was difficult to imagine what would sustain them during the next six months until the monsoon rains. Mesquite appeared to be the only plant species relatively unaffected by the abuse of too much domestic livestock.

I am certain that if livestock numbers were properly controlled along the Little Rann the natural vegetation would better provide the benefits expected from the mesquite plantations. Although the cost of these plantings was formerly Rs. 56 per acre, the cost is now about Rs. 100 per acre or a total of approximately Rs. 200,000 per year. However, until livestock numbers can be brought under control, I feel the Forest Department is wise in continuing their present plantation programme. It was also explained that a few years ago about 200 acres of Eucalyptus was experimentally planted west of Dhrangadhra. Livestock grazing was excluded from the plantation in order to permit the seedlings to take hold. However, the local villagers rebelled against this infringement upon their 'rights' and during a single night they drove all of their livestock through the area. What seedlings were not destroyed by their livestock were then pulled up by hand.

Bird species within the vicinity of the Rann observed during our visit appeared to be restricted to a relatively few species. Several eagles and the omnipresent vultures were observed. By far the most common birds were small larks, which were encountered in flocks of 50 to 100 or more. Demoiselle cranes were frequently seen along the mainland and an occasional pair of sarus cranes. Flamingos were also observed flying overhead, but none were observed to light. North of Tikar, however, thousands of flamingo tracks were evident on a mud flat within the Little Rann.

The Indian Wild Ass

Description

The Indian Wild Ass or Onager somewhat resembles a zebra in build. The ears are relatively short, particularly in comparison to those of a donkey or mule. The neck appears to be on the thin side as compared to the stockiness of the rest of the body. The short mane remains erect and the dark medio-dorsal stripe that extends to the base of the tail

often gives the appearance of a continuous mane along the entire back. The tail is not thickly haired and, excluding the brush or tuft of coarse hair at the end, extends only to the hocks.

Specimens measured by Sálim Ali (1946b) indicated that the normal adult head and body length slightly exceeds seven feet, the tail is approximately one foot long, the ear-length is 7-8 inches and the average shoulder height is just over four feet. The adult males which he collected weighed just over 500 lb. and females about 450 lb. Dharmakumarsinhji (1959), however, stated that females are usually 'stouter' than males. I found that these animals are extremely difficult to sex in the field. They rarely allow one to approach closer than several hundred yards and the testes of the males ascend into the body cavity when they are running. However, most of the animals which I distinguished as males appeared to be somewhat larger than the females. Once we spotted a solitary ass sprawled out in the desert, which appeared to have recently died. While approaching I thought, 'At last I'll have the opportunity to examine closely a wild ass.' I even had my tape out to take measurements, but when we came within 20 feet of the animal, it staggered to its feet and ran off. It had only been sleeping.

The coloration of the Indian Wild Ass is particularly striking. The tips of the ears and the tail, as well as the short mane and medio-dorsal stripe are dark amber brown to almost a brownish-black. The face and jaws, the top half of the neck, fore part of the shoulders, the saddle and sides of the rump (posterior to the flanks) are a bright reddish buff to fawn—almost a palamino colour. The muzzle, throat, lower half of the neck, most of the tail, and the underparts are white.

The bright coloration, larger and stockier build and the more stately manner immediately set the Indian Wild Ass apart from its long-eared and dingy grey or brown-coloured domestic relatives. There is little resemblance to the much smaller domestic donkeys common throughout northern India. While it may sound absurd to some or perhaps trite to others, about the best description that I can give of the Indian Wild Ass is that it is a beautiful and magnificent beast.

In contrast to the local domestic donkeys, which breed during any season of the year, the wild ass is reported to mate from August through October. It is claimed that during this time the males fight viciously for the females. The gestation period is roughly 11 months. Thus, the young are born from July through September. With the exception of one small male that was less than a month old, the foals which I observed during the latter part of December were of uniform size and appeared to be about $3\frac{1}{2}$ to $4\frac{1}{2}$ months old. If correct, this would mean that they were born in August or September, which would have been during the latter part of the normal foaling season.

Group Size

Sálim Ali reported that the sexes live apart in separate herds or troops until the foals are about three months old. Although I observed some males with females and young, a few smaller groups appeared to be all males. Not including two solitary males nor a solitary female with her young foal, the average size for 14 troops totalling 186 asses was just over 13 (3-31). The average size for seven troops with young was 19 or an average of 15 adults + 4 young. These latter figures approximate the 6-8 young per group of 20-30 as observed by Sálim Ali in March 1946. But my overall totals indicate a ratio of less than one foal for every five adults. Group sizes observed are presented in Table 2.

TABLE 2

INDIAN WILD ASSES OBSERVED IN THE LITTLE RANN OF KUTCH IN DECEMBER 1966

	Adults	Young	Total
December 20 (Jesda to Kharaghoda) ..	22	8	30
	4	—	4
	26	5	31
	1	1 (less 1 mo.)	2
	8	—	8
	18	4	22
	1 (male)	—	1
	13	2	15
	7	—	7
December 21 (Tikar to Khuda) ..	7	4	11
	10	2	12
	1 (male)	—	1
	9	4	13
	3	—	3
	5	—	5
	11	—	11
	14	—	14
Total ..	160	30	190

Populations

The total Indian Wild Ass population for the Little Rann was estimated by Sálim Ali in 1946 to be between 3,000 and 5,000. He also believed their numbers were 'increasing year by year.' Wynter-Blyth estimated a total population of about 4,000 in 1956 and claimed that groups were then 'always in sight' once one entered the Little Rann north of Dhrangadhra. He also reported that some herds numbered over 200 head. The numbers of wild asses had apparently been decimated by disease prior to E. P. Gee's survey in 1962. He estimated a total of only 860-870 in the Little Rann proper plus 10 along the border of West Pakistan and the Great Rann.

Regretfully, neither time nor facilities permitted me to undertake a full-scale census or survey of the present status of the wild ass. However,